IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Bisaria et al**
Attorney Docket No.: **CL1365USNA**
Serial No.: **09/479,712**
Group Art Unit: **1774**
Filed: **January 7, 2000**
Examiner: **Gray, J.**

For: **INJECTION MOLDABLE CONDUCTIVE AROMATIC THERMOPLASTIC LIQUID CRYSTALLINE POLYMERIC COMPOSITIONS**

Exhibit A to the

DECLARATION
Of

Mukesh K. Bisaria
Under 37 C.F.R. § 1.131

LABORATORY NOTEBOOK

PROPERTY OF

DU PONT CANADA INC.

RESEARCH & DEVELOPMENT

KINGSTON ONTARIO

№ 2460

NOTEBOOK NO. 2460

ISSUED TO MUKESH BHARIA

ON JAN 27 1998

DEPARTMENT FUEL CELL- KHURANA

RETURNED 19

PREVIOUS BOOK# NONE

NEXT BOOK # 2466

—SCIENTIFIC NOTEBOOK CO.—
2831 LAWRENCE AVE.
P.O. BOX 238
STEVENSVILLE, MI 49127
616-429-8285

Project No. 12127
Book No. 2460 TITLE OPERATING INSTRUCTIONS FOR INJECTION MOLDING OF LCP AND [illegible] COMPOSITES

130

From Page No.

HARD COPY IS CONTROLLED ONLY IF PRINTED ON LIGHT BLUE PAPER

RESEARCH & DEVELOPMENT, KINGSTON

Subject: Operating Instructions for Injection Molding of filled LCP with metal coated graphite and Carbon fiber filled Conductive PPS from RTP Company

Issue Date: 98/10/05
Expiry Date: 98/12/05
Author: Mukesh Bisaria
Department: Fuel Cell Prog.
Area: CTC
Title: Research Scientist

Approved by:
Date Approved: OCT 7, 98

Page 1of2 , Printed on 98/10/07 at 14:33

Filename: FC-01\2460-130.doc *Rev.: 001*

The OI must be reviewed and muet be signed by M. Bisaria, N. Lake and G. Oliver, Nissei operator.

Mukesh Bisaria **Norm Lake** **Gerry Oliver/machine operator**

All pertinent design information is included in this document. contract #: 98-12

GENERAL INFORMATION: Scope and Purpose of this Trial:
We are developing several conductive formulations for conductive bi polar plate applications. OI 2460-40,60 and 90 describe the background of the work with LCP and fluoropolymers formulations. The intent of these injection molding test is to use off the self long fiber composite materials to injection mold and test the electrical conductivity of the molded plaques. The matrix used in these trials are primarily polyphenylene sulphide (Fortron® PPS from Hoechst) and liquid Crystal polyester (Zenite® LCP from DuPont). The conductive fillers are the combinations of carbon fibers, Ni coated graphite fibers and two different kinds of graphite (Thermocarb® from Conoco and Vein® Graphite from Superior). Use of Stainless steel fiber filled have resulted in unbroken fibers bundling up and blocking of the nozzle/flow melt which led to long hold up times for the PPS and hence its CROSSLINKING and all the associated issues. We have no plans to do any Steel fiber work in this OI and on this machine.

SAFETY:
Please follow all the precautionary instructions as listed in the MSDSs of every filler and every resin (all MSDS are enclosed with this OI.. Due to dry flow behavior of some of the fillers during handling, they may be harmful by inhalation and ingestion. And also may cause eye and skin irritation. Wash thoroughly after handling. Pl. discuss and concerns on usage, handling, feeding and molding of these composition with Mukesh or Norm Lake at any time during the work. Use only with proper and effective ventilation. Avoid spilling the materials on the floor to prevent slippage. Use normal precautions in handling hot polymer and these fillers - wear proper personal protective equipment and use local ventilation to remove fumes from the work aree. Minimal air impact via fumes to local ventilation system. For any health and safety concerns, contact: Mukesh Bisaria or Mohamed Abdou as soon as possible.

DRYING TIME (MINIMUM) AND TEMPERATURE FOR DIIFFERENT RESINS AND FILLERS:

Filled PPS Resin formulations :	4 HOURS AT 270F (132C) in (tray or hopper)
Nylon 6 and ny6 filled formulations:	5 HOURS AT 80C in (tray is better)
Nickel or Ni-Copper Coated Fibers:	5 HOURS AT 230F (110C) in TRAY
Zenite® LCP HX6000 Resin/resin bonded "cut "fibers:	12 hrs minimum at 220F (104C) try Rupe's hopper dryers
D12 bonded Ni "cut" Fibers :	24 hrs minimum at 60-70C (tray)

PROCESSING CONDITIONS AND PLASTICATING SCREW GEOMTERY

For 2460-130-100 series Formulations (LCP+NICG and NiCuNICG Fibers)

ZONES:	REAR	MID	FRONT	Nozzle	MELT	MOLD
TEMPS (F):	570	580	590	590	590	230 (and 125/75*)

For 2460-130-200 series Formulations (nylon6 and 60% nickel coated fibers)

ZONES:	REAR	MID	FRONT	Nozzle	MELT	MOLD
TEMPS (F):	490	500	510	500	510	200 (and 25/75*)

For 2460-130-300 series Formulations: PPS+Carbon Fiber (RTP formulations)

ZONES:	REAR	MID	FRONT	Nozzle	MELT	MOLD
TEMPS (F):	580	590	600	600	600	300 (and 215/125/75*)

* suggested mold temp. only (rheology of samples will dictate the lowest temp. for complete IIII)

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Witnessed & Understood by me,	Date	Invented by	Date
[illegible] 5.6.b136		Recorded by	OCT 20, 98

I. MOLDING OF LCP & TOPAZ® COMPOSITES Book No. 2460 131

No. 130

HARD COPY IS CONTROLLED ONLY IF PRINTED ON LIGHT BLUE PAPER

RESEARCH & DEVELOPMENT, KINGSTON
Subject: Operating Instructions for Injection Molding of filled LCP with metal coated graphite and Carbon fiber filled Conductive PPS from RTP Company

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Author: Mukesh Bisaria
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Area: CTC
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Approved by: _____
Date Approved: _____

Filename: FC-01\2460-130.doc Rev.: 001

The operator can modify any molding conditions as appropriate but changes must be recorded.

OTHER MOLDING PARAMETERS and machine details:

- Injection speed: Approx. 2" per second;
- Injection pressure: BEGIN WITH MINIMUM (WE MAY HAVE TO RAISE IT AS WE SEE THE FILLRATE eg molded sample quality/homogeneity of the electrical conductivity)
- Back pressure: 0-30 psi (MINIMIZE);
- Screw speed: 20-40 rpm (MINIMIZE);
- Cushion/pad: 0.25 inch?

SCREW GEOMETRY:

1.Zone distribution = 30% feed , 50% transition, and 20% metering.
2.Compression ratio = 2:1 to 3:1.
3.L/D ratio = 18:1 to 22:1.
4.Minimum screw diameter = 40 mm
5. Feed zone channel depth = 4.5 mm Metering zone channel depth = 2.25mm
6.Pitch = 1D

NON-RETURN VALVE AND SCREW TIP

A 100% free-flowing check ring non-return valve is recommended for processing THESE materials. Ball-check non-return valves are not recommended because they restrict flow and reduce fiber length.

NOZZLE AND NOZZLE TIP: orifice diameter at least 7/32" and straight flow

It is imperative to use a general purpose design nozzle and nozzle tip. A generous orifice diameter will ensure restriction free material flow. A recommended orifice diameter of at least 7/32" will not only assist in streamlining flow but will also allow the long fibers to pass through undamaged.
Do not use internally tapered tips (often called "nylon tips"), or tips without a constant diameter pathway.

RUNNERS, SPRUES, AND GATES

Full-round runner systems of 1/4" dia. are recommended, although trapezoidal equivalents are acceptable. Sprues should have an initial diameter of at least 1/4". For smooth flow, gates should be large and rectangular, at least 1/4" x 1/8".

SHOT WEIGHT: 30-60% of the machine's maximum capacity.

For each blend, please mold a minimum of: 12 Plaques (standard family mold III) of 4"x5". Mark them in the order the parts are ejected from the machine. First, second, third etc.

COMPOSITE MATERIALS DETAILS:

LCP FORMULATIONS:

2460-130-100	virgin LCP HX8000 (dried)
2460-130-101	LCP+40% Ni coated Graphite Fiber (1/4" long)
2460-130-102	LCP+40% Ni coated Graphite Fiber (1/2" long)
2460-130-103	LCP+20% Ni coated Fiber (1/4")+20% Ni coated Graphite Fiber (1/2") long)
2460-130-104	LCP+40% Ni Cu Ni Coated Graphite Fiber (1/4" long)
2460-130-105	LCP+40% Thermocarb+20% Ni Coated Fiber (1/4"+1/2" 50/50 blend))
2460-130-106	LCP+20% Thermocarb+40% Ni Coated Fiber (1/4" and ½" 50/50 blend)

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Project No. 10127
Book No. 2460 TITLE Tefzel® CONDUCTIVE COMPOSITES

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From Page No. 131

HARD COPY IS CONTROLLED ONLY IF PRINTED ON LIGHT BLUE PAPER

RESEARCH & DEVELOPMENT, KINGSTON
Subject: Operating Instructions for Injection Molding of filled LCP with metal coated graphite and Carbon fiber filled Conductive PPS from RTP Company

Issue Date: 98/10/05
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Date Approved: _____

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Filename: FC-01\2460-130.doc Rev.: 001

2460-130-108 LCP+40% NI Coated Graphite (LCP binder) Fibers (1/2")-from tubing line
2460-130-108 8 LCP+40% Ni Coated Graphite (D12 binder) Fibers (1/2")-from tubing line – NO LCP ONLY D12.
2460-130-199 LCP+15% Ni (Y4") 715% Ni (Y2")
2460-130-110 LCP + 10% Ni (Y4") + 10% Ni (Y2")

Nylon 6 FORMULATIONS:

2460-130-200 virgin nylon 6 (BASF)
2460-130-201 nylon 6 +60% ni coated fibers from

PPS FORMULATIONS:

2460-130-300 virgin PPS (from Ticona Fortron PPS)

following formulations are all from RTP Company

2460-130-301 PPS+10% NI Coated graphite fibers (1381 HEC)
2460-130-302 PPS+15% NI Coated graphite fibers (1382 HEC
2460-130-303 PPS+20% NI Coated graphite fibers (1383 HEC)
2460-130-304 PPS+30% Ni Coated graphite fibers (1386 HEC)
2460-130-305 PPS+40% Ni Coated graphite fibers (1387 HEC)

2460-130-306 PPS+40% Carbon fibers (1385)
2460-130-307 PPS+20% NI Coated graphite fibers (1387 HEC)+20% *Carbon fibers (1385)*
(50/50 blend of HEC1387HEC and 1385)

OBSERVATIONS:

1. Record actual injection molding conditions, for inclusion in lab notebook.
2. Record molding behavior and machine performance (nozzle drool, incomplete fill, too high pressure, difficult to eject, etc.) for each of the composition.
3. PL. RETAIN AT LEAST ONE GATE, RUNNER AND SPRUE (AS MOLDED PLASTIC COMPOSITE) FROM EACH OF THE ABOVE SAMPLES.
4. VACUUM SEAL ALL THE SAMPLES AND SEND TO NORM LAKE OR MUKESH BISARIA.

LOCATION OF QUALITY RECORDS:

Compression molding work OI (backhround work): 2482-61-CMCP02.doc (M. Abdou's Book)
INJECTION MOLDING RUN RECORD: .....
OSERVATIONS AND COMMENTS RECORD: .....

2460-130-111 Tefzel + 40% T/C + 20% NCG (50:50 of Y6" & Y2")

Tefzel molding conditions: starting point.

REAR	MID	FRONT	NOZZLE	melt	mold
570 / 580	580/590	590/600	590/600	590/600	COLD

1) ADJUST TEMP PROFILE & MOLD TEMP. AS NECESSARY ... APPLY PRECAUTION ... DO NOT > 325°C

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Recorded by

COMPOSITES OF LCP & TEFZELS

Book No. 2460

Page No. 132

NISSEI INJECTION MOLDING MACHINE

TIMERS

ECTION	CURING	CYCLE START
4 SEC.	18 SEC.	1 SEC.

BACK PRESSURE	CORE TEMP.	CAV. TEMP.
0 psi	oC	oC

Back pressure increased during mixing due to temp. variation

INJECTION VELOCITY

V3	V2	V1	V0
25 %	30 %	30 %	50 %

S2	S1	SP	SD
8 mm.	18 mm.	46 mm.	57 mm.

MOLD CLAMP

LAMP VEL.	SLOW VEL.	LOW PRES.
20 %	15 %	15 %

INJECTION PRESSURE

P3	P2	P1
50 %	50 %	50 %

TP2	S3
2 SEC.	10 SEC.

ION PRES.
85 %

MOLD OPEN

SLOW VEL.	OPEN VEL.	DT2
20	30	.1

EJECT

I VEL.	TEMP. COUNT
10 %	1

MOLD	Trimmer III. Plaques
MAT'L	Filled LCP
OI #	2460-130
DATE	Oct. 8/98
END USE	Testing
CUSTOMER	M. Bisaria
PROJECT #	13132

TEMPS:

MELT	602 oF	FRONT	590 oF	REAR	570 oF
NOZZLE	590 oF	MID	580 oF		

Time at pressure

Oct. 9/98 Injection Molding 01, 2460-130

2460-130-103 : Mold temp 30°C at start, 70°C at the end
LCP + 40% NCG Melt temp 607°F. See run sheet for other cond.

2460-130-104 : Mold temp 70°C at start, 75-76 at the end
LCP + 40% CuNCG All other conditions the same as previous run.

2460-130-105 : Mold temp 70°C at start, 80°C at the end.
LCP + 40% TLCP + 20% NCG Pressure increased to 70% to fill mold. All else the same.

2460-130-109 : Mold temp 90°C at start 87°C at the end.
LCP + 30% NCG Pressure 35, 35, 35, Shot size 3.4.

2460-130-110 Mold temp 85°C at start, 87°C at the end.
LCP + 20% NCG Pressure 34, 34, 34

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nessed & Understood by me,	Date	Invented by	Date
pl. see p134		Recorded by	OCT 20, 98

Project No. 13154

Book No. 2460 TITLE INJECTION MOLDING OF LCP & TOFE CONDUCTIVE COMPOSITES.

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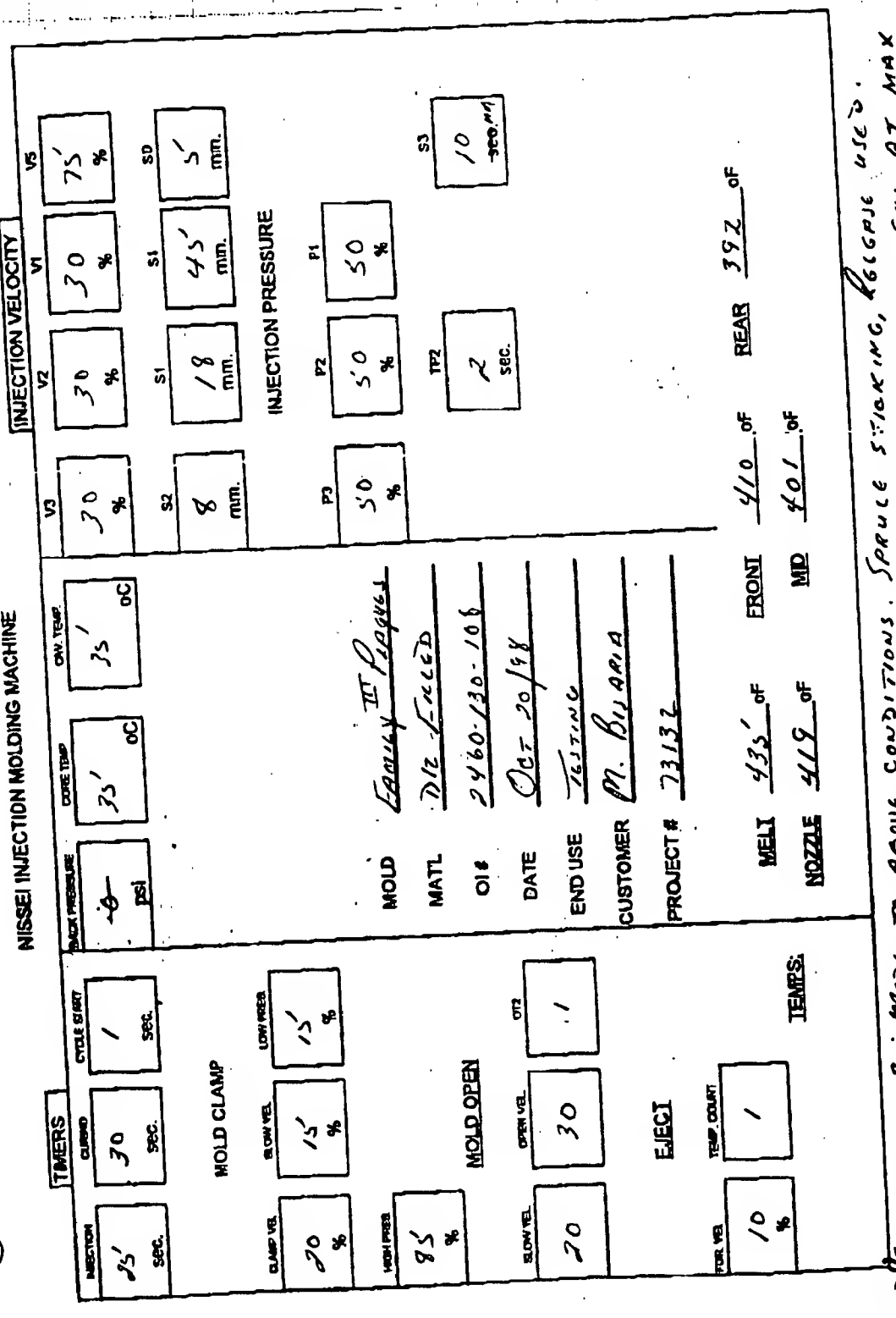

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SUMMARY OF D.I. 2460-130' Book No. 2460 135

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FORMULATIONS SUCCESSFULLY MOLDED

2460-130-103	LCP + 20% NCG (Y2") + 20% NCG (Y4")
2460-130-104	LCP + 40% NiCu G (Y4")
2460-130-105	LCP + 40% T/C + 10% NCG (Y4") + 10% NCG (Y2")
2460-130-109	LCP + 15% NCG (Y4") + 15% NCG (Y2")
2460-130-110	LCP + 10% NCG (Y4") + 10% NCG (Y2")
2460-130-108	WITH D12 ONLY (NO LCP)
2460-130-111	TORLON® HT 2195
2460-130-100	LCP HX8000 VIRGIN.

FORMULATIONS NOT MOLDED

2460-130-200	CONSIDERED NOT NECESSARY FOR THE TIME BEING.
2460-130-201	
2460-130-107	NOT READY - LCP COATING NOT SUCCESSFUL
2460-130-101	NOT NECESSARY
2460-130-102	CONSIDERED TOO MUCH FIBER.
2460-130-106	
2460-130-301	MATERIALS NOT ARRIVED IN TIME FOR WORK.
2460-130-302	
2460-130-303	
2460-130-304	
2460-130-305	
2460-130-306	
2460-130-307	

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—	—	Recorded by	OCT 20, 98

Project No. 1515 1
Book No. 2460 TITLE Initial Results of 2460-150

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From Page 135

To: Mahender K Khurana/ECD@DuPont
cc: Mukesh K Bisaria/CAN/DuPont@DuPont
Subject: electrical conductivity target met and then some more.

Mahender:

I thought you will like to know my theory about this was correct and we seem to have hit the jackpot. The key to this were:

1. Right way to mold.
2. Right mix. of fillers, and loadings (less can really deliver more- sort of change in our thinking)
3. Use of effective binder for fibers.
4. Building the thinking (e.g. PPS experience).
5. and Good Luck, of course :-)

Regards

mukesh.

---------- Forwarded by Mukesh K Bisaria/CAN/DuPont on 08/10/98 04:56 PM ----------

Mukesh K Bisaria 08/10/98 04:55

To: Duane J Erdmann/AE/DuPont@DuPont, Mohamed Abdou/CAN/DuPont@DuPont, Edward D Cohen/AE/DuPont@DuPont, Edward J Fahy/AE/DuPont@DuPont, Peter Andrin/DuPont@DuPont, Bill C Knapp/AE/DuPont@DuPont, David L Reichert/AE/DuPont@DuPont, Raj G Rajendran/AE/DuPont@DuPont, Cynthia A Lundgren/AE/DuPont@DuPont, Gerry Lavin/AE/DuPont@DuPont, Aaron J Becker/AE/DuPont@DuPont, Sridhar Kumar/AE/DuPont@DuPont, Bill C Knapp/AE/DuPont@DuPont
cc: Norm J Lake/CAN/DuPont@DuPont, Mukesh K Bisaria/CAN/DuPont@DuPont
Subject: electrical conductivity target met and then some more.

Fuel Cell Team:
Electronic Conductivity and Heat Managment:

Under this segment, the key issue was to develop a electrically conductive (<0.01 ohm.cm) polymeric formulation that can be injection molded. I am very pleased to record that we met this target today and also exceeded by almost an order of magnitude at almost half of the filler(s) loadings of the incombent kynar-graphite composites. It has been a very challenging problem and I plan to build a very broad patent case which should allow our DuPont FC program to have a sustainable competitive advantage. I should have the NOI filed very quickly. There is also a very good potential for significant cost savings and we will work on it next. I will update in our next meeting.

Summary of just molded plaues are enclosed for your information. The conductivity results are amazingly isotropic, reproducible and stable. I would appreciate your comments nonetheless.

1. **about 111 out of 126 points measured show 0.00x number with minium of 0.002 ohm.cm**
2. **about 15 out of 126 points show a 0.0x number with a maximum of 0.0306 ohm cm.**
3. 4 out of 7 plaques show only 0.00x numbers (and no 0.0x) everywhere?
3. for those of you craving for more numbers, an excel file is enclosed.

But you will have to wait till next team meeting to see the plaques. I must recognize the hard work of my support Norm Lake for achieving this target. He and Gerry Oliver (molding operator) have been key to the success of all our molding work thus far.
So thanks guys,

Best Regards

Witnessed 138

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Orihal Results of 2460-130 Project No. Book No. 2460. 137

Page No. 136

VOLUMETRIC RESISTIVITY (OHM.CM) OF FORMULATION 2460-130-103

INJECTION MOLDED DUPONT FILLED ZENITE LCP (MEASURED BY 4 POINT PROBE)

plaque #1 (molded at:38C mold temperature)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0033	0.0031	0.0083	0.0078
0.0026	0.0037	0.0065	0.0093
0.0021	0.0040	0.0053	0.0100
0.0039	0.0048	0.0098	0.0120
0.0037	0.0123	0.0093	0.0308
0.0035	0.0083	0.0088	0.0208
0.0058	0.0032	0.0145	0.0080
0.0028	0.0126	0.0070	0.0315
0.0021	0.0026	0.0053	0.0065
0.0027	0.0033	0.0068	0.0083
0.0032	0.0044	0.0080	0.0110

#1: min.= 0.0053 and max=0.0308 ohm.cm

plaque #2 (molded at mold temp.40-50C)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0022	0.0028	0.0055	0.0070
0.0035	0.0021	0.0088	0.0053
0.0025	0.0028	0.0065	0.0070
0.0027	0.0035	0.0068	0.0088
0.0027	0.0008	0.0068	0.0020
0.0027	0.0021	0.0068	0.0053
0.0030	0.0036	0.0075	0.0090

#2: min.=0.0020 and max=0.0090 ohm.cm

plaque #3 (molded 50-55C mold temperature)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0022	0.0029	0.0055	0.0073
0.0028	0.0027	0.0070	0.0068
0.0030	0.0040	0.0075	0.0100
0.0013	0.0036	0.0033	0.0090
0.0041	0.0011	0.0103	0.0028
0.0029	0.0027	0.0073	0.0068
0.0014	0.0029	0.0035	0.0073
0.0046	0.0034	0.0115	0.0085
0.0029	0.0042	0.0073	0.0105

#3: min.= 0.0033 and max=0.0105 ohm.cm

plaque #4 (molded at mold temp.50-55C)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0029	0.0029	0.0073	0.0073
0.0028	0.0027	0.0070	0.0068
0.0030	0.0040	0.0078	0.0100
0.0013	0.0036	0.0033	0.0090
0.0041	0.0011	0.0103	0.0028
0.0029	0.0027	0.0073	0.0068
0.0014	0.0029	0.0035	0.0073
0.0048	0.0034	0.0115	0.0085
0.0029	0.0042	0.0073	0.0105

#4: min.=0.0028 and max=0.0100 ohm.cm

plaque #5 (molded at: 50-60C mold temperature)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0032	0.0014	0.0080	0.0035
0.0036	0.0011	0.0090	0.0028
0.0014	0.0037	0.0035	0.0093
0.0011	0.0016	0.0028	0.0040
0.0025	0.0026	0.0063	0.0065
0.0010	0.0022	0.0025	0.0055
0.0014	0.0026	0.0035	0.0065
0.0024	0.0029	0.0060	0.0085
0.0051	0.0027	0.0128	0.0068

#5: min.= 0.0025 and max=0.0093 ohm.cm

plaque #6 (molded at mold temp.60-60C)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0029	0.0012	0.0073	0.0030
0.0041	0.0024	0.0103	0.0060
0.0019	0.0027	0.0048	0.0068
0.0022	0.0015	0.0055	0.0038
0.0009	0.0028	0.0023	0.0070
0.0015	0.0018	0.0038	0.0045
0.0025	0.0023	0.0063	0.0058
0.0029	0.0010	0.0066	0.0025
0.0040	0.0021	0.0100	0.0053

#6: min.=0.0023 and max=0.0070 ohm.cm

plaque #7 (molded at 50-60C mold temperature)

ohm side 1	ohm side 2	ohm.cm side 1	ohm.cm side 2
0.0010	0.0016	0.0025	0.0040
0.0031	0.0016	0.0078	0.0040
0.0018	0.0020	0.0040	0.0050
0.0023	0.0020	0.0058	0.0050
0.0020	0.0036	0.0050	0.0090
0.0014	0.0018	0.0035	0.0040
0.0014	0.0014	0.0035	0.0035
0.0024	0.0023	0.0060	0.0058
0.0018	0.0026	0.0048	0.0065

#7: min.= 0.0025 and max=0.0065 ohm.cm

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Read & Understood by me.	Date	Invented by	Date
✗ - See p138	—	Recorded by	Oct 20, 98

Project No. 23159 Initial Results of ...

Book No. 2460

SUMMARY OF INJECTION MOLDED PLAQUES (ALL LCP)

RESISTIVITY (Ω-cm)

LCP + 40%* NCG FIBERS
2460 - 130 - 103 PLAQUES — 0.003 TO 0.008 Ω-cm
A FEW POINTS AROUND 0.01 ORSO

LCP + 30%* NCG FIBERS
2460 - 130 - 109 PLAQUES — FROM 0.005 TO 0.02
(SOME HIGH SPOTS?)
VERY FEW - ABERRATL

LCP + 20%* NCG FIBERS
2460 - 130 - 110 PLAQUES — ALL OVERFLOW
VERY VERY HIGH Ω-cm

LCP + 40% NCuN C G FIBERS
2460 - 130 - 104 PLAQUES — BELOW 0.01 - TO - 0.03 OHM-CM

LCP + 20% NCG FIBERS + 40% THERMOCARB
2460 - 130 - 105
BELOW 0.01 TO 0.05 OHM.CM
MORE LIKE 0.03 MAX.

* BLEND (50/50) OF ½" & ¼" FIBERS

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Witnessed & Understood by me,	Date	Invented by	Date
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BULK CONDUCTIVITY DATA OI# 2460-130 **Book No.** 2460

BULK CONDUCTIVITY DATA
FOR FILLED CONDUCTIVE COMPOSITES OF
ZENITE® LCP8000 AND TEFZEL® H72195 WITH NCG FIBERS
AND THERMOCARB® CF 300 GRAPHITE.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		2460-130-103					2460-130-105					2460-130-109		
2		LCP+40% NCG Fib					LCP+20% NCG Fib+40% TC					LCP+30% NCG Fibers		
3	Volume Resistance		Volume Resistivity			Volume Resistance		Volume Resistivity			Volume Resistance		Volume Resistivity	
4	side A	Side B	side A	Side B		side A	Side B	side A	Side B		side A	Side B	side A	Side B
5	ohm	ohm	ohm.cm	ohm.cm		ohm	ohm	ohm.cm	ohm.cm		ohm	ohm	ohm.cm	ohm.cm
6	0.0033	0.0031	0.00825	0.00775		0.0118	0.0191	0.0295	0.04775		0.0036	0.0021	0.0090	0.0053
7	0.0026	0.0037	0.0065	0.00925		0.0103	0.0111	0.02575	0.02775		0.0041	0.0021	0.0103	0.0053
8	0.0021	0.0040	0.00525	0.01		0.0048	0.0095	0.012	0.02375		0.0027	0.0025	0.0068	0.0063
9	0.0039	0.0048	0.00975	0.012		0.0050	0.0061	0.0125	0.01525		0.0026	0.0027	0.0065	0.0068
10	0.0037	0.0123	0.00925	0.030625		0.0082	0.0128	0.0205	0.032		0.0023	0.0040	0.0058	0.0100
11	0.0035	0.0083	0.00875	0.02075		0.0061	0.0355	0.01525	0.08875		*0.0012*	*0.0067*	0.0030	0.0168
12	0.0058	0.0032	0.0145	0.008		0.0065	0.0088	0.01625	0.022		0.0031	0.0040	0.0078	0.0100
13	0.0028	0.0126	0.007	0.0315		0.0151	0.0160	0.03775	0.04		0.0028	0.0048	0.0070	0.0120
14	0.0021	0.0026	0.00525	0.0065		*0.0101*	*0.0085*	0.02525	0.02125		0.0013	0.0029	0.0033	0.0073
15	0.0027	0.0033	0.00675	0.00825		0.0140	0.0440	0.035	0.11		0.0050	0.0029	0.0125	0.0073
16	0.0032	0.0044	0.008	0.011		0.0047	0.0018	0.01175	0.0045		0.0031	0.0027	0.0078	0.0068
17	0.0022	0.0028	0.0055	0.007		0.0064	0.0046	0.016	0.0115		0.0020	0.0070	0.0050	0.0175
18	0.0035	0.0021	0.00875	0.00525		0.0101	0.0059	0.02525	0.01475		0.0021	0.0036	0.0053	0.0090
19	0.0026	0.0028	0.0065	0.007		0.0130	0.0151	0.0325	0.03775		*0.0027*	*0.0046*	0.0068	0.0115
20	0.0027	0.0035	0.00675	0.00875		0.0112	0.0127	0.028	0.03175		0.0040	0.0074	0.0100	0.0185
21	0.0027	0.0008	0.00675	0.002		0.0055	0.0166	0.01375	0.0415		0.0040	0.0029	0.0100	0.0073
22	0.0027	0.0021	0.00675	0.00525		0.0122	0.0075	0.0305	0.01875		0.0107	0.0035	0.0268	0.0088
23	0.0030	0.0036	0.0075	0.009		*0.0076*	*0.0018*	0.019	0.0045		0.0042	0.0021	0.0105	0.0053
24	0.0022	0.0029	0.0055	0.00725		0.0139	0.0204	0.03475	0.051		0.0040	0.0026	0.0100	0.0065
25	0.0028	0.0027	0.007	0.00675		0.0061	0.0069	0.01525	0.01725		0.0042	0.0085	0.0105	0.0213
26	0.0030	0.0040	0.0075	0.01		0.0054	0.0050	0.0135	0.0125		0.0025	0.0038	0.0063	0.0095
27	0.0013	0.0036	0.00325	0.009		0.0073	0.0158	0.01825	0.0395		0.0020	0.0082	0.0050	0.0205
28	0.0041	0.0011	0.01025	0.00275		0.0010	0.0046	0.0025	0.0115		0.0025	0.0051	0.0063	0.0128
29	0.0029	0.0027	0.00725	0.00675		0.0064	0.0016	0.016	0.004		0.0037	0.0017	0.0093	0.0043
30	0.0014	0.0029	0.0035	0.00725		0.0043	0.0008	0.01075	0.002		0.0049	0.0032	0.0123	0.0080
31	0.0046	0.0034	0.0115	0.0085		0.0097	0.0072	0.02425	0.018		0.0043	0.0061	0.0108	0.0153
32	0.0028	0.0042	0.00725	0.0105		0.0108	0.0111	0.027	0.02775		0.0039	0.0033	0.0098	0.0083
33	0.0029	0.0029	0.00725	0.00725		0.0217	0.0261	0.05425	0.06525		0.0036	0.0047	0.0090	0.0118
34	0.0028	0.0027	0.007	0.00675		0.0129	0.0047	0.03225	0.01175		0.0090	0.0059	0.0225	0.0148
35	0.0030	0.0040	0.0075	0.01		0.0044	0.0094	0.011	0.0235		0.0041	0.0040	0.0103	0.0100
36	0.0013	0.0036	0.00325	0.009		0.0064	0.0063	0.016	0.01575		0.0045	0.0036	0.0113	0.0090
37	0.0041	0.0011	0.01025	0.00275		0.0077	0.0083	0.01925	0.02075		0.0078	0.0036	0.0195	0.0090
38	0.0029	0.0027	0.00725	0.00675		0.0034	0.0102	0.0085	0.0255		0.0044	0.0026	0.0110	0.0065

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Project No. 15157

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
39	0.0014	0.0029	0.0035	0.00725		0.0019	0.0099	0.00475	0.02475		0.0051	0.0027	0.0128	0.0068
40	0.0046	0.0034	0.0115	0.0085		0.0068	0.0064	0.017	0.016		0.0030	0.0051	0.0075	0.0128
41	0.0029	0.0042	0.00725	0.0105		0.0137	0.0296	0.03425	0.074		0.0027	0.0062	0.0068	0.0155
42	0.0032	0.0014	0.008	0.0035		0.0071	0.0022	0.01775	0.0065		0.0041	0.0042	0.0103	0.0105
43	0.0036	0.0011	0.009	0.00275		0.0126	0.0074	0.0315	0.0185		0.0037	0.0054	0.0093	0.0135
44	0.0014	0.0037	0.0035	0.00925		0.0032	0.0044	0.008	0.011		0.0189	0.0076	0.0473	0.0190
45	0.0011	0.0016	0.00275	0.004		0.0100	0.0055	0.025	0.01375		0.0058	0.0041	0.0145	0.0103
46	0.0025	0.0026	0.00625	0.0065		0.0026	0.0163	0.0065	0.04075		0.0037	0.0027	0.0093	0.0068
47	0.0010	0.0022	0.0025	0.0055		0.0013	0.0130	0.00325	0.0325		0.0034	0.0035	0.0085	0.0088
48	0.0014	0.0026	0.0035	0.0065		0.0073	0.0073	0.01825	0.01825		0.0033	0.0055	0.0083	0.0138
49	0.0024	0.0026	0.006	0.0065		0.0041	0.0018	0.01025	0.0045		0.0031	0.0062	0.0078	0.0155
50	0.0051	0.0027	0.01275	0.00675		0.0094	0.0042	0.0235	0.0105		0.0039	0.0035	0.0098	0.0088
51	0.0029	0.0012	0.00725	0.003		0.0127	0.0050	0.03175	0.0125		0.0044	0.0032	0.0110	0.0080
52	0.0041	0.0024	0.01025	0.006		0.0102	0.0071	0.0255	0.01775		0.0065	0.0026	0.0138	0.0065
53	0.0019	0.0027	0.00475	0.00675		0.0126	0.0121	0.0315	0.03025		0.0027	0.0048	0.0068	0.0120
54	0.0022	0.0015	0.0055	0.00375		0.0154	0.0257	0.0385	0.06425		0.0035	0.0055	0.0088	0.0140
55	0.0009	0.0028	0.00225	0.007		0.0073	0.0145	0.01825	0.03625		0.0035	0.0044	0.0088	0.0110
56	0.0015	0.0018	0.00375	0.0045		0.0083	0.0070	0.02075	0.0175		0.0048	0.0020	0.0120	0.0050
57	0.0025	0.0023	0.00625	0.00575		0.0086	0.0088	0.0215	0.022		0.0032	0.0029	0.0080	0.0073
58	0.0022	0.0010	0.0055	0.0025		0.0157	0.0110	0.03925	0.0275		0.0022	0.0029	0.0055	0.0073
59	0.0040	0.0021	0.01	0.00525		0.0133	0.0050	0.03325	0.0125		0.0023	0.0044	0.0058	0.0110
60	0.0010	0.0016	0.0025	0.004		0.0075	0.0174	0.01875	0.0435		0.0013	0.0022	0.0033	0.0055
61	0.0031	0.0016	0.00775	0.005		0.0135	0.0061	0.03375	0.015225		0.0035	0.0053	0.0088	0.0133
62	0.0016	0.0020	0.004	0.005		0.0135	0.0154	0.03375	0.0385		0.0039	0.0048	0.0096	0.0120
63	0.0023	0.0020	0.00575	0.005		0.0063	0.0033	0.01325	0.00825		0.0040	0.0033	0.0100	0.0083
64	0.0020	0.0036	0.005	0.009		0.0194	0.0030	0.0485	0.0075		0.0036	0.0043	0.0090	0.0108
65	0.0014	0.0016	0.0035	0.004		0.0050	0.0093	0.0125	0.023325		0.0030	0.0043	0.0075	0.0108
66	0.0014	0.0014	0.0035	0.0035		0.0068	0.0139	0.017	0.034175		0.0042	0.0040	0.0105	0.0100
67	0.0024	0.0023	0.006	0.00575		0.0177	0.0219	0.04425	0.054		0.0061	0.0022	0.0153	0.0055
68	0.0019	0.0026	0.00475	0.0065		0.0085	0.0112	0.02125	0.028		0.0049	0.0094	0.0123	0.0235
69	0.0033	0.0026	0.00825	0.0065		0.0191	0.0195	0.04775	0.04875		0.0114	0.0069	0.0285	0.0223
70	0.0019	0.0021	0.00475	0.00625		0.0047	0.0041	0.01175	0.01025		0.0063	0.0059	0.0158	0.0148
71	0.0017	0.0013	0.00425	0.00325		0.0067	0.0070	0.01675	0.0175		0.0041	0.0063	0.0103	0.0158
72	0.0023	0.0026	0.00575	0.0065		0.0132	0.0091	0.033	0.02275		0.0073	0.0056	0.0183	0.0140
73	0.0043	0.0037	0.01075	0.00925		0.0166	0.0102	0.0415	0.0255		0.0035	0.0031	0.0088	0.0078
74	0.0040	0.0008	0.01	0.002		0.0195	0.0089	0.04875	0.02225		0.0036	0.0042	0.0090	0.0105
75	0.0041	0.0051	0.01025	0.01275		0.0096	0.0120	0.024	0.03		0.0049	0.0042	0.0123	0.0105
76	0.0026	0.0031	0.0065	0.00775		0.0087	0.0088	0.02175	0.022		0.0036	0.0036	0.0090	0.0090

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
77	0.0023	0.0013	0.00575	0.00325		0.0034	0.0157	0.0085	0.03925		0.0032	0.0037	0.0080	0.0093
78	0.0061	0.0011	0.01525	0.00275		0.0085	0.0173	0.02125	0.04325		0.0039	0.0042	0.0098	0.0105
79	0.0041	0.0048	0.01025	0.012		0.0112	0.0233	0.028	0.05825		0.0041	0.0058	0.0103	0.0145
80	0.0030	0.0033	0.0075	0.00825		0.0174	0.0096	0.0435	0.024		0.0027	0.0061	0.0068	0.0153
81	0.0032	0.0033	0.008	0.00825		0.0260	0.0098	0.065	0.0245		0.0020	0.0062	0.0050	0.0155
82	0.0013	0.0057	0.00325	0.01425		0.0127	0.0115	0.03175	0.02875		0.0056	0.0020	0.0140	0.0050
83	0.0034	0.0056	0.0085	0.014		0.0062	0.0241	0.0155	0.06025		0.0055	0.0052	0.0138	0.0130
84	0.0053	0.0063	0.01325	0.01575		0.0256	0.0205	0.064	0.05125		0.0043	0.0062	0.0108	0.0155
85	0.0031	0.0019	0.00775	0.00475		0.0186	0.0246	0.0465	0.0615		0.0029	0.00228	0.0073	0.0070
86	0.0040	0.0015	0.01	0.00375		0.0138	0.0253	0.0345	0.06325		0.0025	0.0027	0.0063	0.0068
87	0.0027	0.0013	0.00675	0.00325		0.0139	0.0034	0.03475	0.0085		0.0062	0.0038	0.0155	0.0095
88	0.0016	0.0016	0.004	0.004		0.0127	0.0060	0.03175	0.015		0.0045	0.0022	0.0113	0.0055
89	0.0019	0.0035	0.00475	0.00875		0.0133	0.0078	0.03325	0.0195		0.0082	0.0053	0.0205	0.0133
90	0.0017	0.0024	0.00425	0.006		0.0076	0.0079	0.019	0.01975		0.0049	0.0032	0.0123	0.0080
91	0.0013	0.0041	0.00325	0.01025		0.0051	0.0041	0.01275	0.01025		0.0019	0.0035	0.0046	0.0080
92	0.0022	0.0023	0.0055	0.00575		0.0044	0.0122	0.011	0.0305		0.0038	0.0035	0.0095	0.0068
93	0.0022	0.0025	0.0055	0.00625		0.0071	0.0102	0.01775	0.0255		0.0072	0.0024	0.0180	0.0060
94	0.0023	0.0027	0.00575	0.00675		0.0104	0.0034	0.026	0.0085		0.0068	0.0039	0.0170	0.0098
95	0.0026	0.0016	0.0065	0.004		0.0091	0.0143	0.02275	0.03575		0.0045	0.0018	0.0113	0.0045
96	0.0024	0.0017	0.006	0.00425		0.0042	0.0011	0.0106	0.00275		0.0059	0.0035	0.0148	0.0088
97	0.0024	0.0021	0.006	0.00525		0.0122	0.0106	0.0305	0.0265		0.0059	0.0056	0.0148	0.0165
98	0.0023	0.0019	0.00575	0.00475		0.0096	0.0122	0.024	0.0305		0.0029	0.0042	0.0073	0.0105
99	0.0024	0.0031	0.006	0.00775		0.0029	0.0153	0.00725	0.03825		0.0030	0.0043	0.0075	0.0108
100	0.0013	0.0026	0.00325	0.0065		0.0069	0.0150	0.01725	0.0375		0.0043	0.0026	0.0108	0.0065
101	0.0023	0.0019	0.00575	0.00475		0.0237	0.0034	0.05925	0.0085		0.0037	0.0021	0.0093	0.0053
102	0.0018	0.0015	0.0045	0.00375		0.0186	0.0070	0.0465	0.0175		0.0027	0.0039	0.0068	0.0098
103	0.0015	0.0019	0.00375	0.00475		0.0098	0.0116	0.0245	0.029		0.0027	0.0028	0.0068	0.0070
104	0.0034	0.0016	0.0085	0.004		0.0078	0.0088	0.0195	0.022		0.0045	0.0032	0.0113	0.0080
105	0.0020	0.0014	0.005	0.0035		0.0035	0.0144	0.00875	0.036		0.0023	0.0034	0.0058	0.0085
106	0.0031	0.0016	0.00775	0.004		0.0152	0.0161	0.038	0.04025		0.0048	0.0022	0.0120	0.0055
107	0.0025	0.0007	0.00625	0.00175		0.0069	0.0095	0.01475	0.02375		0.0046	0.0016	0.0115	0.0040
108	0.0027	0.0026	0.00675	0.0065		0.0147	0.0068	0.03675	0.017		0.0034	0.0022	0.0085	0.0055
109	0.0020	0.0022	0.005	0.0055		0.0048	0.0035	0.012	0.00875		0.0024	0.0025	0.0060	0.0063
110	0.0018	0.0028	0.0045	0.007		0.0049	0.0074	0.01225	0.0185		0.0032	0.0028	0.0080	0.0070
111	0.0029	0.0046	0.00725	0.0115		0.0065	0.0356	0.01625	0.089		0.0020	0.0036	0.0050	0.0090
112	0.0034	0.0028	0.0085	0.007		0.0159	0.0213	0.03975	0.05325		0.0034	0.0024	0.0085	0.0060
113	0.0032	0.0014	0.008	0.0035		0.0062	0.0140	0.0205	0.035		0.0044	0.0017	0.0110	0.0043
114	0.0033	0.0023	0.00825	0.00575		0.0083	0.0087	0.00075	0.02175		0.0030	0.0026	0.0075	0.0065

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Recorded by

Date Nov 2, 98

Project No. 73157

Book No. 2460 TITLE BULK CONDUCTIVITY DATA 0.1.2466

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
115	0.0021	0.0022	0.00525	0.0055		0.0166	0.0056	0.0413	0.014		0.0018	0.0019	0.0045	0.0048
116	0.0025	0.0024	0.00625	0.006		0.0081	0.0093	0.02025	0.02325		0.0036	0.0041	0.0090	0.0103
117	0.0015	0.0022	0.00375	0.0055		0.0091	0.0086	0.02275	0.0215		0.0027	0.0057	0.0068	0.0143
118	0.0022	0.0014	0.0055	0.0035		0.0044	0.0097	0.011	0.02425		0.0014	0.0018	0.0035	0.0045
119	0.0010	0.0026	0.0025	0.0065		0.0159	0.0106	0.03975	0.0265		0.0026	0.0014	0.0065	0.0035
120	0.0020	0.0027	0.005	0.00575		0.0001	0.0118	0.00025	0.0295					
121	0.0027	0.0024	0.00675	0.006		0.0052	0.0058	0.013	0.0145					
122	0.0040	0.0031	0.01	0.00775		0.0084	0.0125	0.021	0.03125					
123	0.0020	0.0023	0.005	0.00575										
124	0.0030	0.0028	0.0075	0.007										
125	0.0014	0.0030	0.0035	0.0075										
126	0.0015	0.0021	0.00375	0.00525										
127	0.0013	0.0018	0.00325	0.0045										
128	0.0025	0.0014	0.00625	0.0035										
129	0.0042	0.0017	0.0105	0.00425										
130	0.0030	0.0033	0.0075	0.00825										
131	0.0018	0.0037	0.0045	0.00925										
132	0.0019	0.0035	0.00475	0.00875										
133	0.0018	0.0042	0.0045	0.0105										
134	0.0009	0.0015	0.002	0.00375										
135	0.0021	0.0015	0.00525	0.00375										
136	0.0014	0.0015	0.0035	0.00375										
137	0.0027	0.0021	0.00675	0.00525										
138	0.0015	0.0024	0.00375	0.006										
139	0.0024	0.0006	0.006	0.0015										
140	0.0022	0.0009	0.0055	0.00225										
141	0.0018	0.0024	0.0045	0.006										
142	0.0021	0.0022	0.00525	0.0055										
143	0.0022	0.0016	0.0053	0.004										
144	0.0027	0.0026	0.00675	0.0065										
145	0.0031	0.0016	0.00775	0.004										
146	0.0015	0.0046	0.00375	0.0115										
147	0.0019	0.0064	0.00475	0.016										
148	0.0019	0.0049	0.00475	0.01225										
149	0.0046	0.0012	0.0115	0.003										
150	0.0016	0.0011	0.004	0.00275										
151	0.0024	0.0014	0.006	0.0035										
152	0.0012	0.0022	0.003	0.0055										

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Invented by

Date NOV 2, 98

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
153	0.0007	0.0033	0.00175	0.00825										
154	0.0017	0.0024	0.00425	0.006										
155	0.0030	0.0032	0.0075	0.008										
156	0.0020	0.0015	0.005	0.00375										
157	0.0037	0.0014	0.00925	0.0035										
158	0.0017	0.0022	0.00425	0.0055										
159	0.0016	0.0019	0.004	0.00475										
160	0.0016	0.0027	0.004	0.00675										
161	0.0015	0.0029	0.00375	0.00725										
162	0.0026	0.0025	0.0065	0.00625										
163	0.0024	0.0011	0.006	0.00275										
164	0.0019	0.0014	0.00475	0.0035										
165	0.0043	0.0021	0.01075	0.00525										
166	0.0018	0.0030	0.0045	0.0075										
167	0.0013	0.0020	0.00325	0.005										
168	0.0018	0.0030	0.0045	0.0075										
169	0.0018	0.0032	0.0045	0.008										
170	0.0014	0.0007	0.0035	0.00175										
171	0.0030	0.0022	0.0075	0.0055										
172	0.0023	0.0044	0.00575	0.011										
173	0.0129	0.0074	0.03225	0.0185										
174	0.0018	0.0026	0.0045	0.0065										
175	0.0032	0.0050	0.008	0.0125										
176	0.0055	0.0014	0.01375	0.0035										
177	0.0036	0.0025	0.009	0.00625										
178	0.0040	0.0040	0.01	0.01										
179	0.0052	0.0019	0.013	0.00475										
180	0.0018	0.0067	0.0045	0.01675										
181	0.0028	0.0037	0.007	0.00925										
182	0.0044	0.0039	0.011	0.00975										
183	0.0046	0.0007	0.0115	0.00175										
184	0.0024	0.0014	0.006	0.0035										
185	0.0023	0.0022	0.00575	0.0055										
186	0.0048	0.0018	0.012	0.0045										
187	0.0009	0.0037	0.00225	0.00925										
188	0.0013	0.0026	0.00325	0.0065										
189	0.0035	0.0021	0.00875	0.00525										
190	0.0033	0.0013	0.00825	0.00325										

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160 Book No._____ TITLE _____

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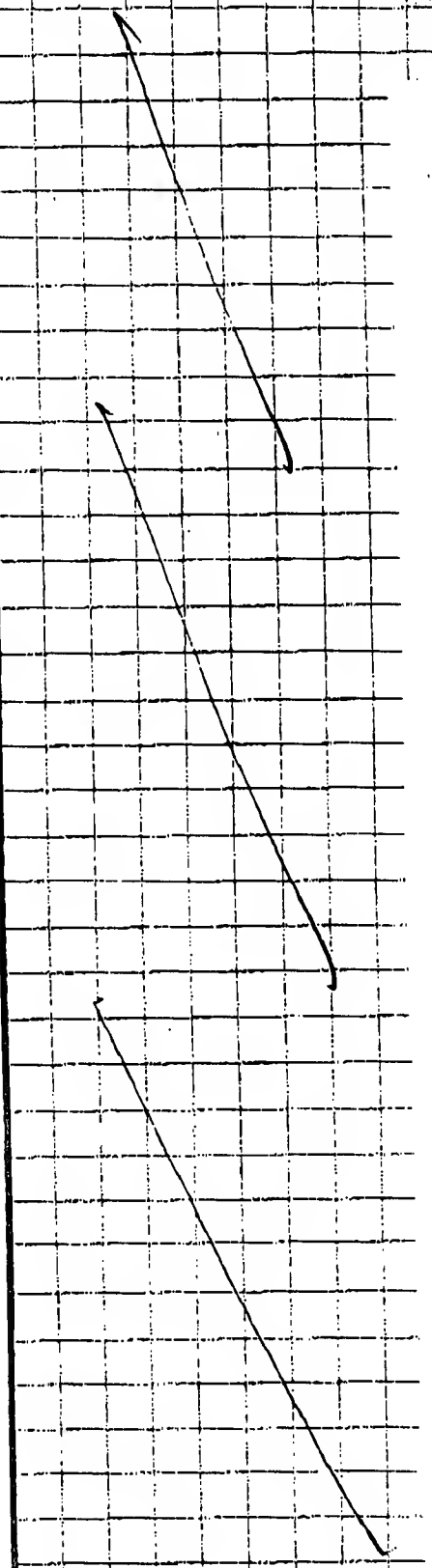

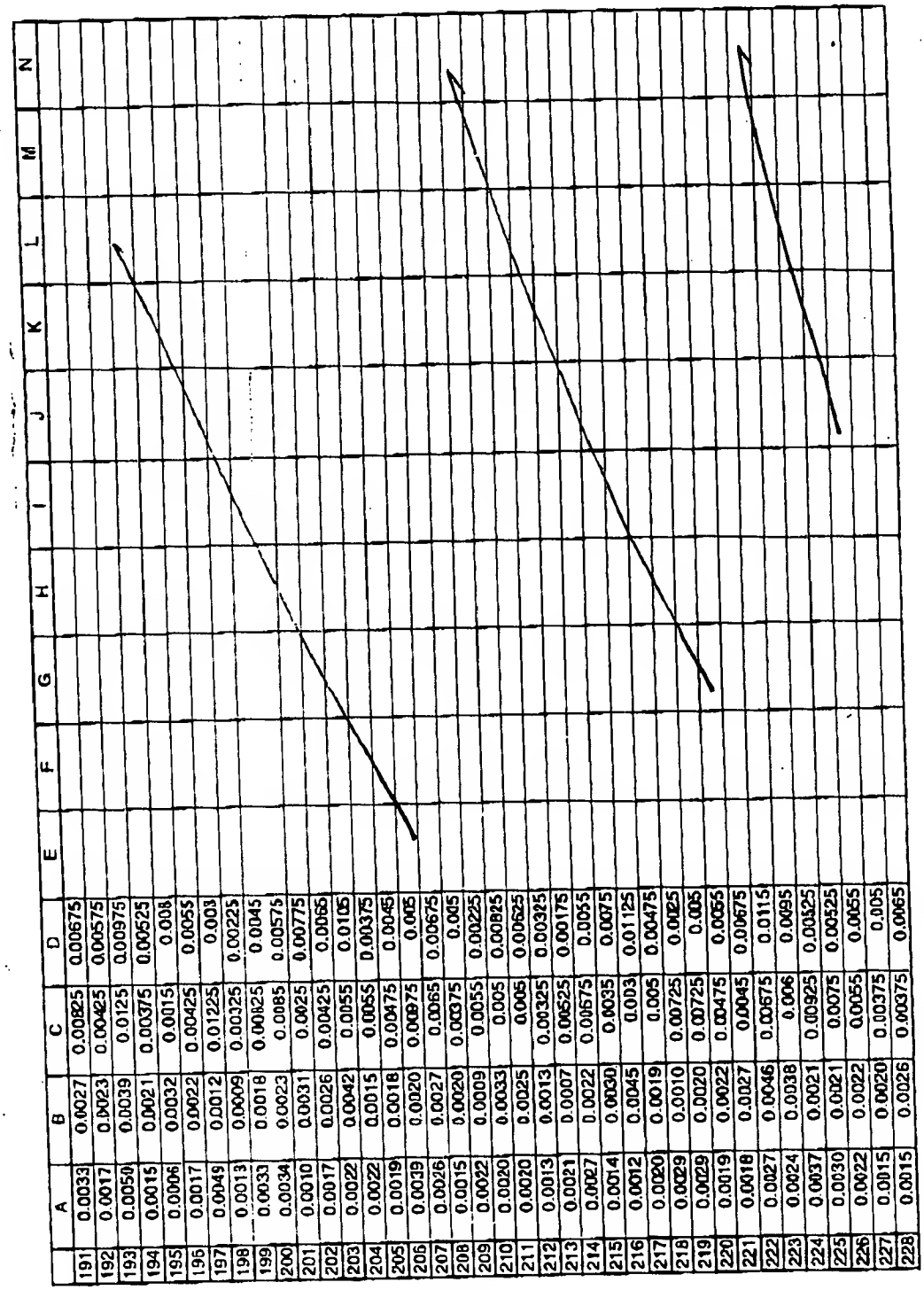

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
191	0.0033	0.0027	0.00825	0.00675										
192	0.0017	0.0023	0.00425	0.00575										
193	0.0059	0.0039	0.0125	0.00975										
194	0.0015	0.0021	0.00375	0.00525										
195	0.0006	0.0032	0.0015	0.008										
196	0.0017	0.0022	0.00425	0.0055										
197	0.0049	0.0012	0.01225	0.003										
198	0.0013	0.0009	0.00325	0.00225										
199	0.0033	0.0018	0.00825	0.0045										
200	0.0034	0.0023	0.0085	0.00575										
201	0.0010	0.0031	0.0025	0.00775										
202	0.0017	0.0026	0.00425	0.0065										
203	0.0022	0.0042	0.0055	0.0105										
204	0.0022	0.0015	0.0055	0.00375										
205	0.0019	0.0018	0.00475	0.0045										
206	0.0039	0.0020	0.00975	0.005										
207	0.0026	0.0027	0.0065	0.00675										
208	0.0015	0.0020	0.00375	0.005										
209	0.0022	0.0009	0.0055	0.00225										
210	0.0020	0.0033	0.005	0.00825										
211	0.0020	0.0025	0.005	0.00625										
212	0.0013	0.0013	0.00325	0.00325										
213	0.0021	0.0007	0.00525	0.00175										
214	0.0027	0.0022	0.00675	0.0055										
215	0.0014	0.0030	0.0035	0.0075										
216	0.0012	0.0045	0.003	0.01125										
217	0.0020	0.0019	0.005	0.00475										
218	0.0029	0.0010	0.00725	0.0025										
219	0.0029	0.0020	0.00725	0.005										
220	0.0019	0.0022	0.00475	0.0055										
221	0.0018	0.0027	0.0045	0.00675										
222	0.0027	0.0046	0.00675	0.0115										
223	0.0024	0.0038	0.006	0.0095										
224	0.0037	0.0021	0.00925	0.00525										
225	0.0030	0.0021	0.0075	0.00525										
226	0.0022	0.0022	0.0055	0.0055										
227	0.0015	0.0020	0.00375	0.005										
228	0.0015	0.0026	0.00375	0.0065										

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	A	B	C	D
229	0.0018	0.0039	0.0045	0.00975
230	0.0036	0.0023	0.009	0.00575
231	0.0027	0.0039	0.00675	0.00975
232	0.0035	0.0026	0.00875	0.0065
233	0.0025	0.0012	0.00625	0.003
234	0.0014	0.0020	0.0035	0.005
235	0.0027	0.0025	0.00675	0.00625
236	0.0015	0.0031	0.00375	0.00775
237	0.0035	0.0022	0.00875	0.0055
238	0.0014	0.0024	0.0035	0.006

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pl. see p166

Date —

Invented by

Recorded by

Date NOV 2, 98

Project No. 1-1-1-1

162 Book No. 2460 TITLE BULK CONDUCTIVITY DATA O.I. #2460

From Page No. 161

	O	P	Q	R	S	T	U	V	W	X
1		2460-130-104						2460-130-111		
2		LCP-40% NiCuG Fibers						Tefzel+20%NCG-40% T/C		
3	Volume Resistance		Volume Resistivity				Volume Resistance		Volume Resistivity	
4	side A	Side B	side A	Side B			side A	Side B	side A	Side B
5	ohm	ohm	ohm.cm	ohm.cm			ohm	ohm	ohm.cm	ohm.cm
6	0.0177	0.0021	0.04425	0.00525			0.0265	0.0281	0.06625	0.07025
7	0.0159	0.0077	0.03975	0.01925			0.017	0.0342	0.0425	0.0855
8	0.0189	0.0128	0.04725	0.032			0.00773	0.0262	0.019325	0.0655
9	0.0076	0.016	0.019	0.04			0.093	0.0167	0.2325	0.04175
10	0.0058	0.0074	0.0145	0.0185			0.0858	0.0909	0.2145	0.22725
11	0.0053	0.0097	0.01325	0.02425			0.0335	0.0128	0.08375	0.032
12	0.0051	0.0095	0.01275	0.02375			0.0142	0.0067	0.0355	0.01675
13	0.0115	0.0148	0.02875	0.037			0.0198	0.0038	0.0495	0.0095
14	0.0029	0.0122	0.00725	0.0305			0.0091	0.0243	0.02275	0.06075
15	0.0085	0.003	0.02125	0.0075			0.0271	0.0266	0.06775	0.067
16	0.0127	0.0036	0.03175	0.009			0.0188	0.0171	0.047	0.04275
17	0.0104	0.0068	0.026	0.017			0.0119	0.028	0.02975	0.07
18	0.0084	0.0055	0.021	0.01375			0.0254	0.0161	0.0635	0.04025
19	0.0061	0.0091	0.01525	0.02275			0.0477	0.0301	0.11925	0.07525
20	0.0026	0.0126	0.0065	0.0315			0.0366	0.0708	0.0915	0.177
21	0.0068	0.0087	0.017	0.02175			0.035	0.0816	0.0875	0.204
22	0.0075	0.013	0.01875	0.0325			0.0202	0.0719	0.0505	0.17975
23	0.0189	0.0016	0.04725	0.004			0.0779	0.0114	0.18475	0.0285
24	0.0069	0.0029	0.01725	0.00725			0.0133	0.0591	0.05325	0.14775
25	0.005	0.0047	0.0125	0.01175			0.0356	0.0245	0.089	0.06125
26	0.0058	0.0057	0.0145	0.01425			0.0196	0.0231	0.049	0.05775
27	0.0083	0.0059	0.02075	0.0145			0.0689	0.0201	0.17225	0.05025
28	0.0097	0.0239	0.02425	0.05975			0.0466	0.0405	0.1165	0.10125
29	0.0089	0.0092	0.02225	0.023			0.0848	0.0289	0.212	0.07225
30	0.0075	0.0042	0.01875	0.0105			0.0188	0.0317	0.047	0.07925
31	0.0084	0.008	0.021	0.02			0.0583	0.0508	0.14575	0.127
32	0.0121	0.0034	0.03025	0.0085			0.0347	0.0424	0.08675	0.106
33	0.0265	0.0061	0.06625	0.01525			0.0315	0.0218	0.07875	0.0545
34	0.0072	0.0063	0.018	0.01575			0.0209		0.05225	
35	0.0073	0.0048	0.01825	0.012						
36	0.0109	0.0047	0.02725	0.01175						
37	0.0039	0.0083	0.00975	0.02075						
38	0.0051	0.0141	0.01275	0.03525						
39	0.0043	0.0042	0.01075	0.0105						
40	0.0036	0.0055	0.009	0.01375						

To Page

Witnessed & Understood by me, Sep 1 1998

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Date NOV 2, 98

BULK CONDUCTIVITY DATA O.J. #2460-130

Project No.

Book No. 2460-

age No. 162

	O	P	Q	R	S	T	U	V	W	X
42	0.0162	0.0051	0.0405	0.01275						
43	0.0131	0.0026	0.03275	0.0065						
44	0.0048	0.006	0.012	0.015						
45	0.0079	0.0094	0.01975	0.0235						
46	0.0031	0.0053	0.00775	0.01325						
47	0.0059	0.0117	0.01475	0.02925						
48	0.0051	0.0066	0.01275	0.0165						
49	0.0126	0.0112	0.0315	0.028						
50	0.0073	0.0051	0.01825	0.01275						
51	0.0069	0.0038	0.01725	0.0095						
52	0.08	0.0061	0.2	0.01525						
53	0.0127	0.0109	0.03175	0.02725						
54	0.0064	0.0042	0.016	0.0105						
55	0.0103	0.0051	0.02575	0.01275						
56	0.0053	0.008	0.01325	0.02						
57	0.0045	0.007	0.01125	0.0175						
58	0.007	0.0052	0.0175	0.013						
59	0.0055	0.0051	0.014	0.01275						
60	0.0126	0.0046	0.0315	0.0115						
61	0.0103	0.0065	0.02575	0.01625						
62	0.0095	0.0128	0.02375	0.032						
63	0.0114	0.0184	0.0285	0.046						
64	0.0075	0.009	0.01875	0.0225						
65	0.0039	0.0023	0.00975	0.00575						
66	0.0051	0.0104	0.01275	0.026						
67	0.0103	0.0053	0.02575	0.01325						
68	0.0046	0.0055	0.0115	0.01375						
69	0.0038	0.0026	0.0095	0.0065						
70	0.0107	0.0077	0.02675	0.01925						
71	0.0051	0.0068	0.01275	0.017						
72	0.01	0.0063	0.025	0.01575						
73	0.0061	0.0027	0.01525	0.00675						
74	0.0067	0.0172	0.01675	0.043						
75	0.0094	0.0143	0.0235	0.03575						
76	0.0088	0.0046	0.022	0.0115						
77	0.0137	0.0044	0.03425	0.011						
78										
79										
80										
81										
82										

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Witnessed & Understood by me,

bl. See p 166

Date —

Invented by

Recorded by

Date NOV 2, 98

Project No. 7354

164 Book No. 2460 TITLE BULK CONDUCTIVITY DATA OF A2460-1.

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PLAQUE SIDE1 SIDE2

Column1		Column2	
Mean	0.002562	Mean	0.002663
Standard E	8.15E-05	Standard E	9.93E-05 ERROR
Median	0.0024	Median	0.0024
Mode	0.0027	Mode	0.0026
Standard D	0.001245	Standard D	0.001515 DEVIATION
Sample Va	1.55E-06	Sample Va	2.3E-06
Kurtosis	19.7149	Kurtosis	14.63096
Skewness	2.906908	Skewness	2.90984
Range	0.0123	Range	0.012
Minimum	0.0006	Minimum	0.0006
Maximum	0.0129	Maximum	0.0126
Sum	0.597	Sum	0.62045
Count	233	Count	233
Confidenc	0.000161	Confidenc	0.000196

FORMULATION 2460-130-103 (LCP+20% NCG Fibers (1/4") + 20% NCG Fibers (1/2")

PLAQUE

SIDE1 SIDE2

Column1		Column2	
Mean	0.024397	Mean	0.027949
Standard E	0.001212	Standard E	0.001741 ERROR
Median	0.02125	Median	0.02375
Mode	0.016	Mode	0.022
Standard D	0.013109	Standard D	0.01883 DEVIATION
Sample Va	0.000172	Sample Va	0.000355
Kurtosis	0.507879	Kurtosis	3.586347
Skewness	0.795714	Skewness	1.605805
Range	0.06475	Range	0.108
Minimum	0.00025	Minimum	0.002
Maximum	0.065	Maximum	0.11
Sum	2.8545	Sum	3.27
Count	117	Count	117
Confidenc	0.0024	Confidenc	0.003448

LCP+20%NCG+40% T/C

FORMULATION 2460-130-105 (LCP+10% NCG Fibers (1/4") + 10% NCG Fibers (1/2")+40% T/C

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BULK CONDUCTIVITY DATA E.I.# 2460-130 Book No. 2460

PLAQUE

SIDE 1		SIDE 2		
Column1		Column2		
Mean	0.010193	Mean	0.009958	
Standard E	0.000522	Standard E	0.000398	ERROR
Median	0.00925	Median	0.009	
Mode	0.00675	Mode	0.00875	
Standard D	0.00557	Standard D	0.004252	DEVIATION
Sample Va	3.1E-05	Sample Va	1.81E-05	
Kurtosis	17.75011	Kurtosis	0.616132	
Skewness	3.329599	Skewness	0.942875	
Range	0.04425	Range	0.02	
Minimum	0.003	Minimum	0.0035	
Maximum	0.04725	Maximum	0.0235	
Sum	1.162	Sum	1.13525	
Count	114	Count	114	
Confidenc	0.001034	Confidenc	0.000789	

FORMULATION 2460-130-108 (LCP+15% NCG Fibers (1/4") + 15% NCG Fibers (1/2")

PLAQUE

SIDE1		SIDE2		
Column1		Column2		
Mean	0.024003	Mean	0.018795	
Standard E	0.00279	Standard E	0.001271	ERROR
Median	0.01875	Median	0.0155	
Mode	0.01275	Mode	0.01275	
Standard D	0.023674	Standard D	0.010782	DEVIATION
Sample Va	0.00056	Sample Va	0.000116	
Kurtosis	43.91557	Kurtosis	2.124982	
Skewness	6.025841	Skewness	1.339638	
Range	0.1935	Range	0.05575	
Minimum	0.0065	Minimum	0.004	
Maximum	0.2	Maximum	0.05975	
Sum	1.72825	Sum	1.35325	
Count	72	Count	72	
Confidenc	0.005563	Confidenc	0.002534	

FORMULATION 2460-130-104 (LCP+40% Nickel-Copper CG Fibers (1/4")

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Project No. [illegible]

Book No. 73159 TITLE BULK CONDUCTIVITY DATA [illegible]

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PLAQUE.

SIDE1		SIDE2	
Column1		Column2	
Mean	0.089675	Mean	0.083964
Standard E	0.01146	Standard E	0.010647
Median	0.06775	Median	0.0685
Mode	0.047	Mode	#N/A
Standard D	0.061713	Standard D	0.05634
Sample Va	0.003808	Sample Va	0.003174
Kurtosis	0.191901	Kurtosis	0.720274
Skewness	1.123503	Skewness	1.188624
Range	0.213175	Range	0.21775
Minimum	0.019325	Minimum	0.0095
Maximum	0.2325	Maximum	0.22725
Sum	2.600575	Sum	2.351
Count	29	Count	28
Confidenc	0.023474	Confidenc	0.021846

ERROR

DEVIATION.

FORMULATION 2460-130-111 (Tefzel+10% NCG Fibers (1/4") + 10% NCG Fibers (1/2")+40% T/C

AVG. VOLUME RESISTIVITY (4 PT. PROBE

1) 2460 - 130 - 103 0.002 ± 0.001 ohm·cm.

2) 2460 - 130 - 109 0.010 ± 0.004 ohm·cm.

3) 2460 - 130 - 105 0.025 ± 0.015 ohm·cm

4) 2460 - 130 - 104 0.023 ± 0.017 ohm·cm.

5) 2460 - 130 - 111 0.086 ± 0.058 ohm·cm.

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Witnessed & Understood by me, page 155 TO 166

Date Feb. 9, 99

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